C80 solutions
Straightforward Building Compliance

# PROPOSED 6 FLATS
# 42/40 DENE ROAD
# LYE VALLEY
# OXFORD
# OX3 7EE

*ENERGY STATEMENT*

*FOR*

**S. HASAJ**

January 2021

Project no. 12000

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# ENERGY ASSESSMENT

| REVISION | DATE | PREPARED BY | REVIEWED BY | COMMENTS |
|---|---|---|---|---|
| 0 | 22/12/2020 | Harry Hinchliffe | M Heptonstall | For Comment |

**The current report provides a brief overview of the wide range of opportunities for renewable energy and is not intended as detailed design advice. As such data and information should only be treated as INDICATIVE at this stage of the process. Further investigation can be undertaken when more accurate and detailed information is required on specific measures.**



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# 1.0 Introduction

## 1.1 About C80 Solutions Ltd

C80 Solutions are independent Sustainability and Energy Consultants providing carbon reduction solutions to help the UK achieve its carbon emission reduction target of 80% by 2050 - as set out in the Government's Climate Change Act 2008.

Our range of affordable but comprehensive solutions for the construction industry are broken down into two sectors; i) Building Compliance and ii) Consultancy.

**Building Compliance:**

Our Building Compliance services include; Code for Sustainable Homes Assessments, SAP Calculations, On Construction Energy Performance Certificates, Water Efficiency Calculations, SBEM Calculations, Commercial EPCs, BREEAM assessments and Air Tightness Testing.

**Consultancy:**

Our experience and exposure to building compliance combined with previous experience and IEMA accredited training means we have built up a vast amount of knowledge which enables us to provide our clients with invaluable advice. Our Consultancy services include; Renewable Energy Feasibility Reports, Energy Statements for planning, Sustainability Statements and Building Compliance Advisory Reports.

## 1.2 Introduction to Developments

C80 Solutions have been instructed to prepare an Energy Statement for the proposed redevelopment of 42/40 Dene Road, Lye Valley, Oxford, OX3 7EE.

The project anticipates the provision of 6 new residential flats and relevant communal areas.

The site is located in the Lye Valley area of Oxford.

The plan of the proposed development can be seen in Figures 1-3 below.

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**Figure 1: Site plan of the proposed development**

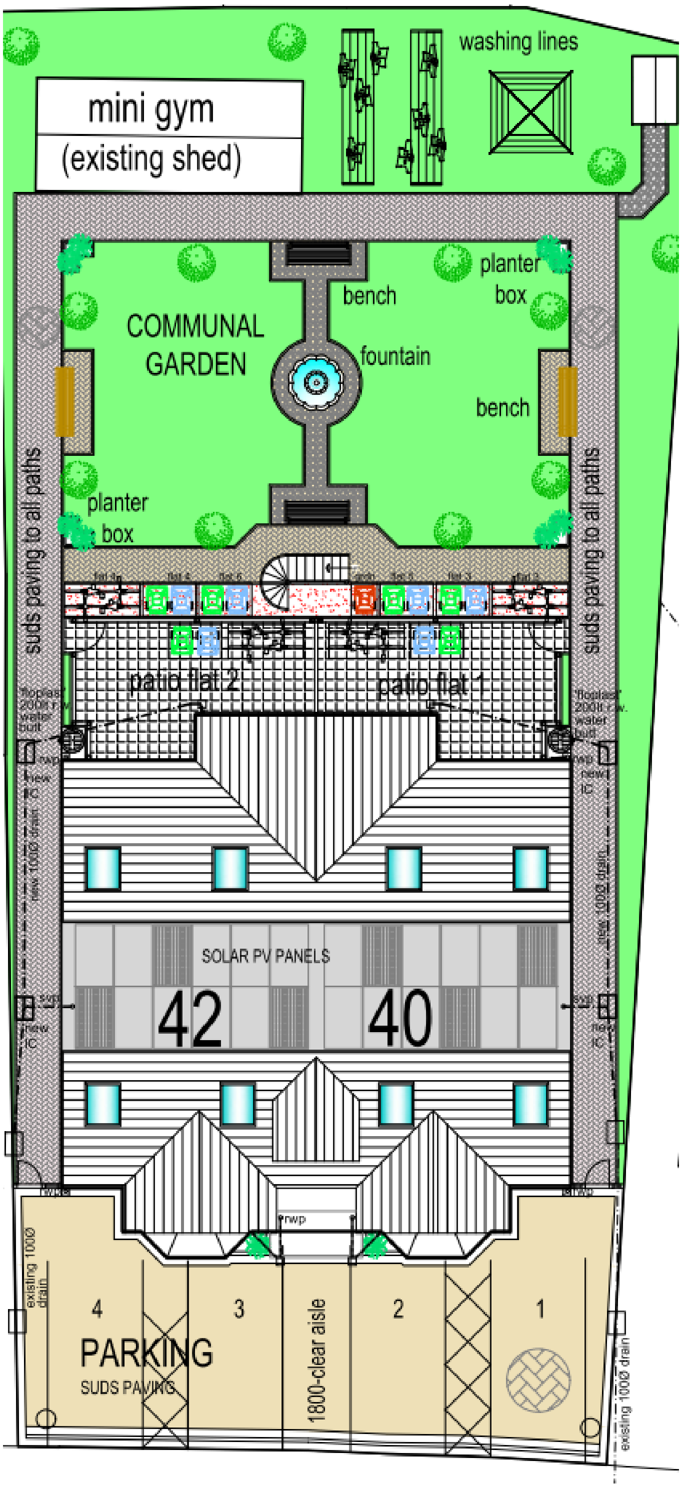

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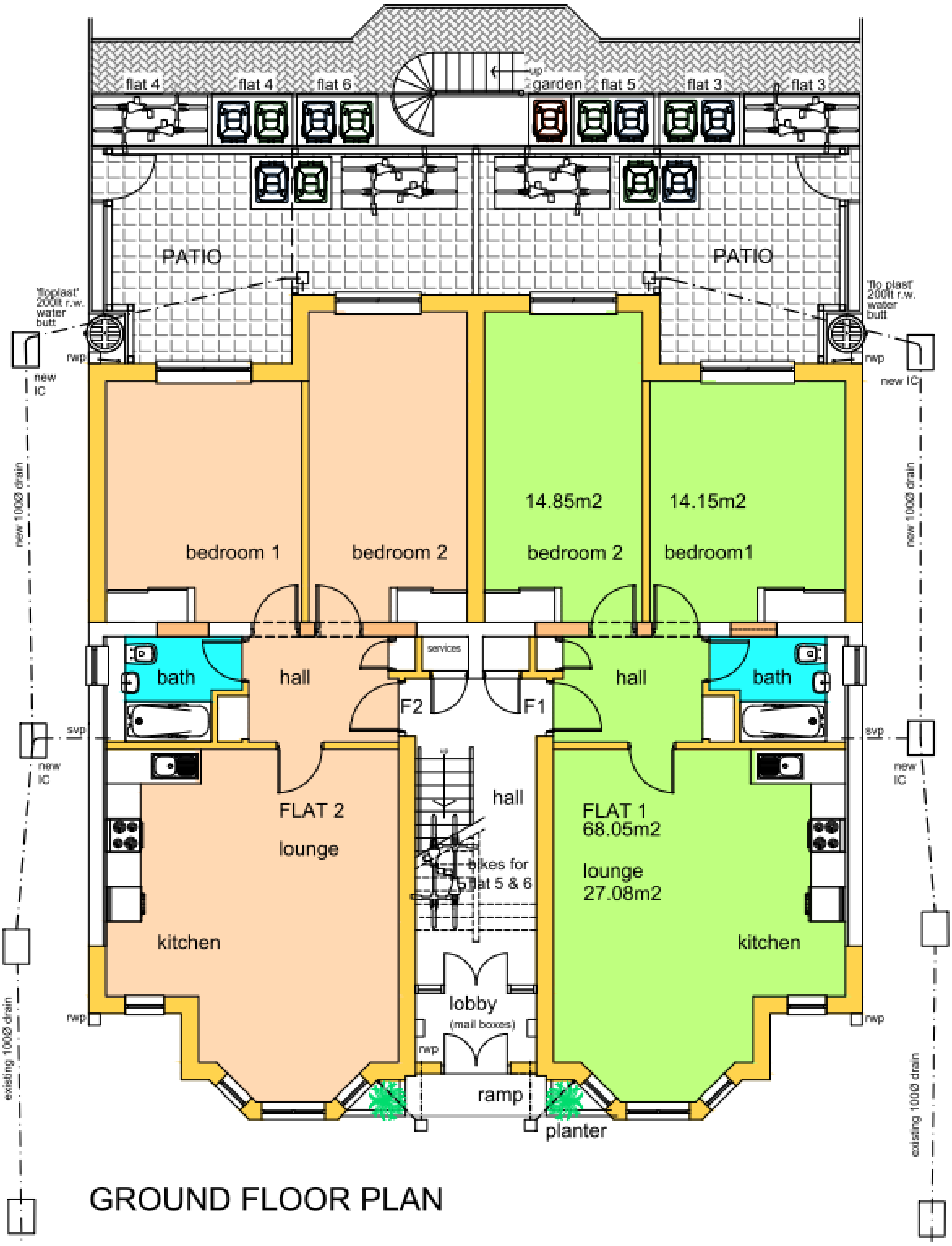
**Figure 2: Typical Floor Plans**

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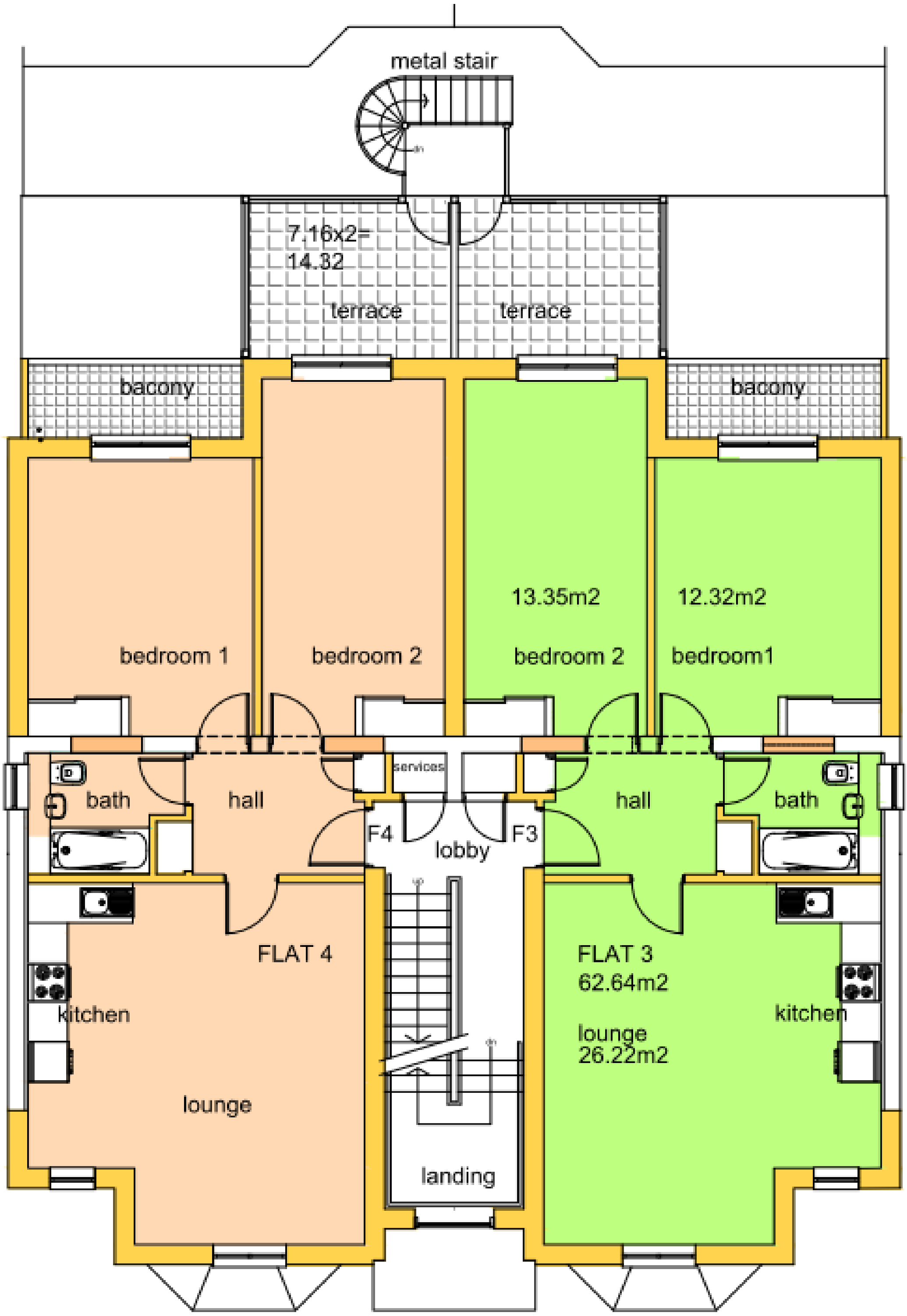


FIRST FLOOR PLAN

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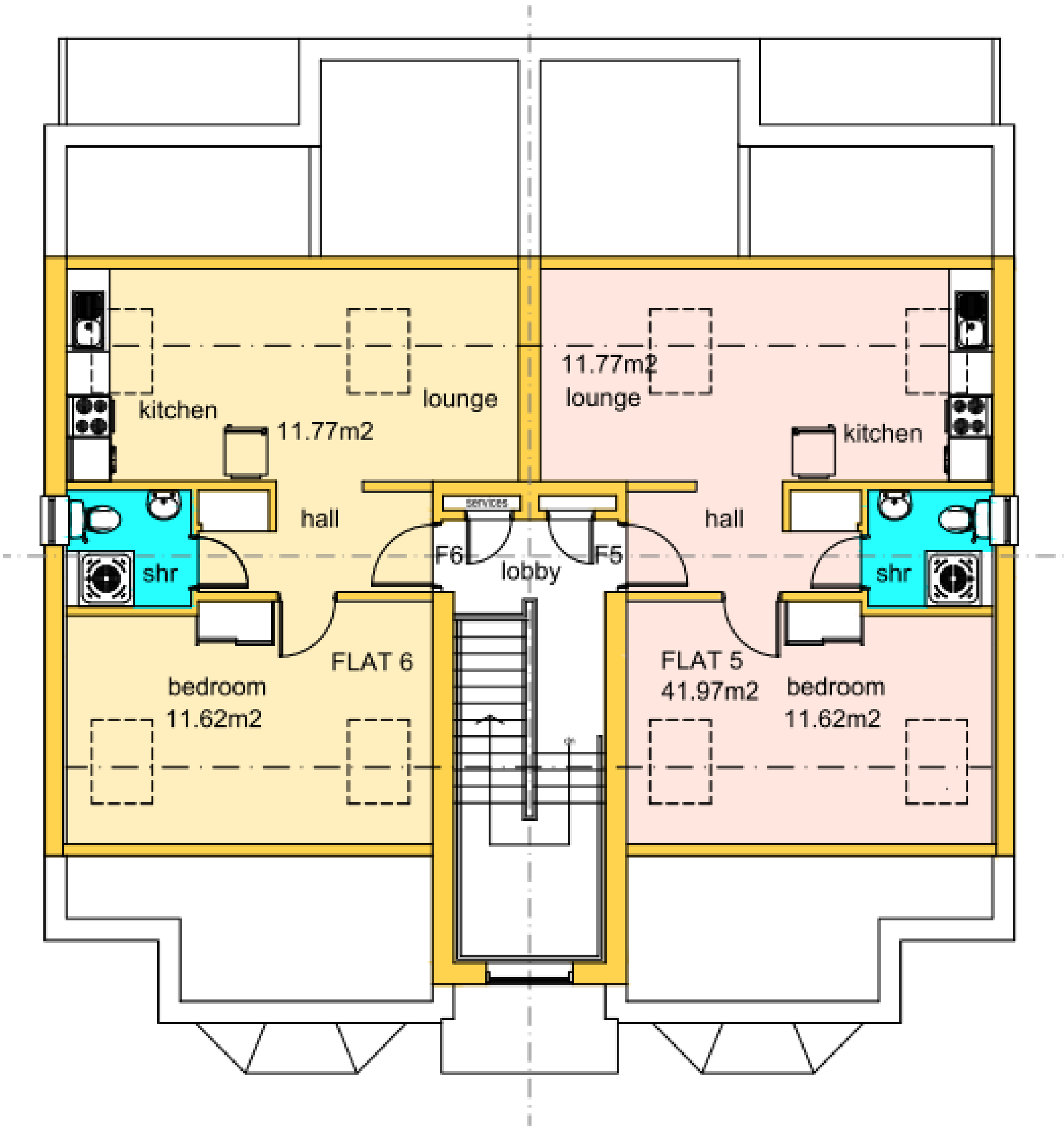
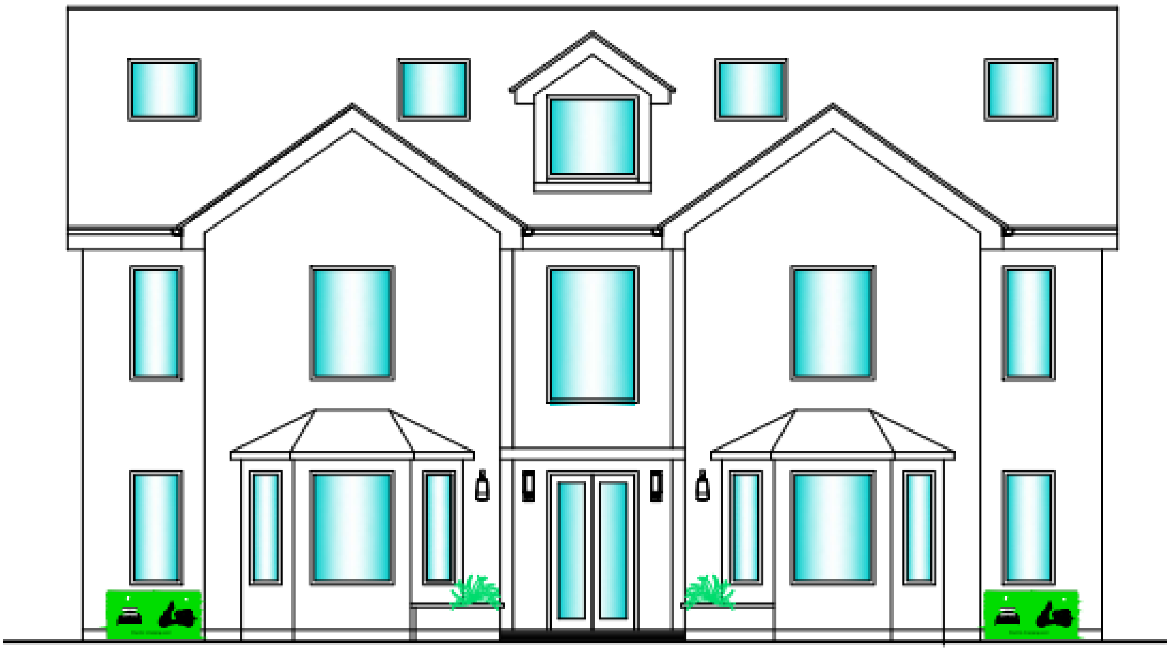
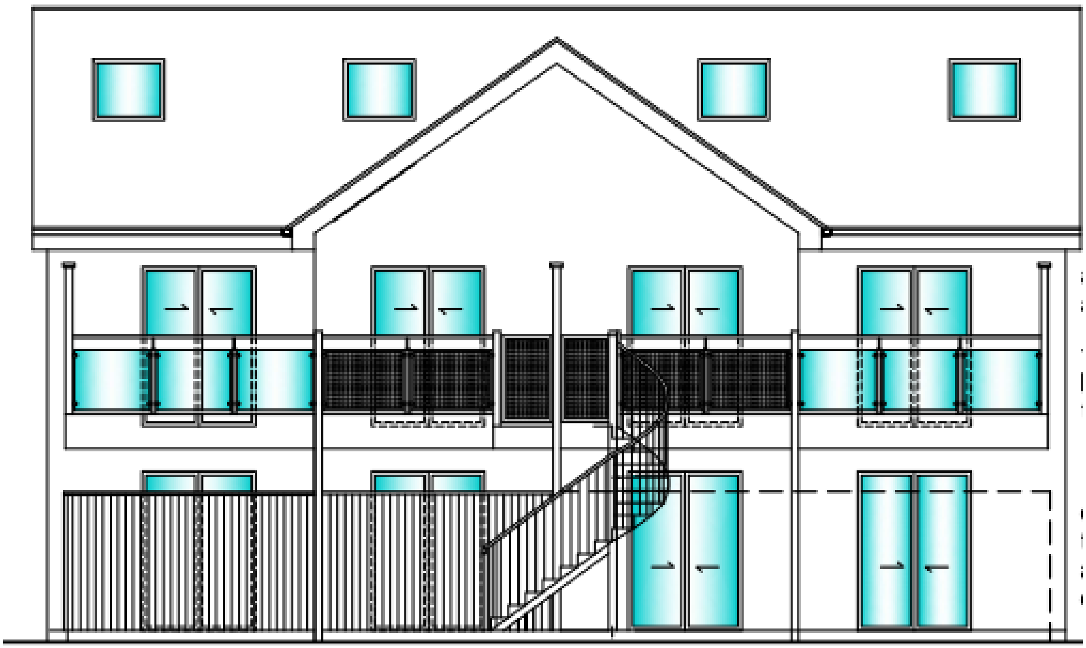



SECOND FLOOR PLAN

**Figure 3: Elevations**



FRONT ELEVATION



REAR ELEVATION

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This statement will demonstrate how the predicted $CO_2$ emissions of the proposed development will be reduced against current building regulations standard.

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## 1.3 Planning Policy

### Policy RE1: Sustainable design and construction

Planning permission will only be granted where it can be demonstrated that the following sustainable design and construction principles have been incorporated, where relevant:

a) Maximising energy efficiency and the use of low carbon energy;

b) Conserving water and maximising water efficiency;

c) Using recycled and recyclable materials and sourcing them responsibly;

d) Minimising waste and maximising recycling during construction and operation;

e) Minimising flood risk including flood resilient construction;

f) Being flexible and adaptable to future occupier needs; and

g) Incorporating measures to enhance biodiversity value.

**Carbon reduction in new-build residential developments (other than householder applications):**
Planning permission will only be granted for new build residential and student accommodation developments (or 25 student rooms or more) which achieve at least a 40% reduction in the carbon emissions from a code compliant base case[17]. This reduction is to be secured through on-site renewable energy and other low carbon technologies (this would be broadly equivalent to 25% of all energy used) and/or energy efficiency measures. The requirement will increase from 2026 to at least 50% reduction in carbon emissions. After 31 March 2030 planning permission will only be granted for residential and student accommodation (25 or more non self-contained student rooms) development that is Zero Carbon.

An Energy Statement will be submitted on schemes of five or more residential dwellings or 1000m². The Energy Statement will include details as to how the policy will be complied with and monitored once installed.

**Carbon reduction in new-build non-residential schemes over 1,000m²:**
Planning permission will only be granted for non-residential development proposals that meet the BREEAM excellent standard (or recognised equivalent assessment methodology). In addition to meeting BREEAM excellent (or recognised equivalent assessment methodology)

Planning permission will only be granted for development proposals over 1000m² which achieve at least a 40% reduction in the carbon emissions compared with a code compliant base case. This reduction is to be secured through on-site renewable and other low carbon technologies and/or energy efficiency measures. The requirement will increase from 2026 to at least 50% reduction in carbon emissions.

The City Council will encourage the development of city wide heat networks. If a heat network exists in close proximity to a scheme it is expected to connect to it and this will count towards the development's carbon reduction requirements. Evidence will be required to demonstrate why connection to the network is not possible.

To ensure that the Council can monitor the effectiveness of renewable and low carbon technologies, non- residential, C2, and C4 and Sui Generis developments will be required to install appropriate energy metering and monitoring equipment and a Display Energy Certificate (DEC) The DEC would be secured by planning condition. DEC assessments must be made available to the Council for the three years after occupation and a DEC rating of A will be expected by the end of the three year period. C3 developments will be required to install appropriate energy metering (smart meters).

**Water efficiency – residential development:**
Proposals for new residential development are to meet the higher water efficiency standard within Building Regulations Part G2 of water consumption target of 110 litres per person per day.

**Water efficiency – non-residential development:**
Proposals for non-residential development are to meet the minimum standard of four credits under the BREEAM assessment.

## 1.4 Methodology

The methodology that has been applied in this report is as follows:

1. Prepare baseline energy calculations for the site based on a Part L 2013 compliant construction specification designed for the development.

2. From the baseline energy calculations, the predicted energy demand for the development in kWh/year and the predicted $CO_2$ emissions in kg$CO_2$/year for the site can be established.

3. Multiplying the site wide predicted $CO_2$ emissions figure by a given % will provide the $CO_2$ reduction achieved.

4. Apply energy efficient design principles (improved fabric spec) in order to reduce the energy demand and $CO_2$ emissions of the site. Prepare energy calculations using the improved fabric specification.

5. From these improved calculations, the reduced energy demand for the development in kWh/year and the predicted $CO_2$ emissions in kg$CO_2$/year for the site can be established.

6. Carry out a renewable energy feasibility study to ascertain which LZC technologies would be suitable for the development.

## 2.0 Predicted Annual Carbon Emissions

Baseline SAP 2012 calculations were prepared based on the construction specification shown in table 1 below.

| Aspect | | New Build |
|---|---|---|
| | **External Walls** | 0.28 |
| | **Ground Floor** | 0.22 |
| | **Flat Roof** | 0.2 |
| | **Windows** | 1.6 |
| | **Doors** | 1.6 |
| | **Party Walls** | 0.0 |
| | **Thermal Bridging** | N/A |
| **Ventilation** | **Airtightness m3/(hr.m²)** | 5 |
| **Heating** | **Heating** | Vaillant Ecotec Pro 28 |
| | **Compensator** | None |
| | **Hot Water** | From Main Heating System |
| | **Controls** | Programmer & TRVs |
| | **Secondary Heating** | N/A |
| **Low energy lighting** | | 100% |
| **Ventilation** | | Natural Ventilation |
| **Renewables / LZC** | | N/A |

**Table 1: Part L compliant construction specifications**

The conducted SAP calculations have shown the proposed development will generate **8,939 kgCO2/year**. In order to satisfy the planning policies on CO2 reduction, the developer is committed to reduce predicted site wide CO2 emissions.

In other words, providing the total site emissions comes to equal to or less than **5,363 kgCO2/year** is achieved once improvements have been made to the calculations, this would prove that a 40% reduction in CO2 emissions has been met as required by the Greater London Planning Policy.

## 3.0 Predicted Annual Energy Demand

Based on using the specification outlined in table 1 above, this would create a total predicted energy demand for the development of **38,44kWh/year**. The breakdown of this predicted energy demand can be seen in table 2 below. The figures quoted have been derived from the Design Stage SAP 2012 Calculations for the development.

| | | | Total Predicted Energy Requirement (kWh/yr) | | | |
|---|---|---|---|---|---|---|
| | | | Space Heating | Water Heating | Lighting, Pumps, Fans | Total Predicted Energy Requirement (kWh/yr) |
| Plot | No. | Units | Electric | Electric | Electric | |
| Flat 1 | 1 | kWh/yr | 5401.65 | 2193.6 | 309.44 | 7979 |
| Flat 2 | 1 | kWh/yr | 5297.49 | 2194.36 | 309.44 | 7876 |
| Flat 3 | 1 | kWh/yr | 3502.84 | 2122.72 | 289.69 | 5990 |
| Flat 4 | 1 | kWh/yr | 3502.84 | 2122.72 | 289.69 | 5990 |
| Flat 5 | 1 | kWh/yr | 3247.64 | 1756.49 | 224.96 | 5304 |
| Flat 6 | 1 | kWh/yr | 3247.64 | 1756.49 | 224.96 | 5304 |

**Table 2: Baseline Predicated Annual Energy Demand**

# 4.0 Reducing Carbon Emissions through Energy Reduction

The Energy Hierarchy sets out the most effective way to reduce a dwelling's $CO_2$ emissions. Firstly, by reducing energy demand, then by using energy efficiently and lastly by incorporating LZC/Renewable technologies.

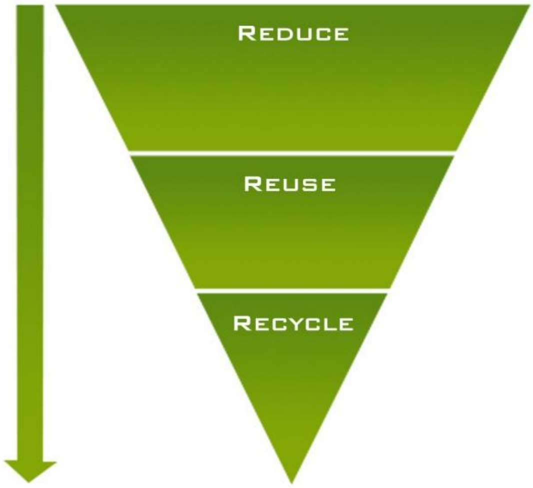


**Figure 3: The Energy Hierarchy**

Reducing the need for energy usage in the dwelling's design:

The first and most cost beneficial action is to reduce the amount of energy needed by the occupants of the dwelling whilst still maintaining or even improving the comfort conditions. A lot can be achieved through passive design, improving the dwelling's external fabric and following principles to reduce air infiltration.

The developer is attempting to reduce the energy demand and CO2 emissions of the development by making the following fabric and energy efficiency improvements to their standard Part L 2013 building specification:

Energy reduction strategies include:

- Adopting enhanced fabric specifications
- Installing high efficiency gas boiler
- Incorporating energy-efficient lighting: 100% of all new lighting to be energy efficient
- Adopting principles of airtight construction
- All new windows will be double-glazed
- Passive Solar Design – Solar gain, solar shading, thermal mass
- Natural / Passive Ventilation strategy

# 5.0 Feasibility Study of Renewable Technologies

This section will assess the technical viability of the following renewable energy technologies for the site in order to rule out unfeasible options:

- Mast mounted wind turbines
- Roof mounted wind turbines
- Solar PV (Photovoltaic) Panels
- Solar Thermal Panels
- ASHP (Air Source Heat Pump)
- GSHP (Ground Source Heat Pump)
- Biomass
- CHP

The following observations have been made with regard to the technical feasibility of integrating renewable energy technologies into this development.

| Renewable Technology | Feasible | Reasons |
|---|---|---|
| Mast Mounted Wind Turbine | No | There is no sufficient open land for a mast mounted wind turbine to be installed on site. |
| | | The site is situated in a densely populated area. Surrounding properties aren't far enough away to be unaffected by turbine noise, reflected light and shadow flicker. |
| | | The site area is surrounded by buildings and other obstructions that could cause uneven and turbulent wind patterns. Turbulent air conditions may reduce lifespan of components. |
| | | Currently the BWEA suggests a large wind turbine to be viable where wind speed is 7m/s or above. According to the NOABL database the average wind speeds for the site is: 6.7 m/s at 10m, 7.3 m/s at 25m and 7.7 m/s at 45m height for the property postcode (DH8 6LY). Therefore, the wind speeds are not sufficient for a mast mounted wind turbine to be viable. |
| Roof Mounted Wind Turbine | No | The site area is surrounded by buildings and other structures that could cause uneven and turbulent wind patterns. Turbulent air conditions may reduce lifespan of components. |
| | | Roof mounted wind turbines are not yet a proven technology and a number of technical problems have been identified by manufacturers which are being investigated to rectify these issues. Vibration that can be transmitted to the building structure. Noise from a turbine may cause irritation to |

| | | |
|---|---|---|
| | | occupants of the dwelling and adjacent buildings. Noise may also adversely affect ventilation strategy. |
| | | Currently the BWEA suggests a large wind turbine to be viable where wind speed is 7m/s or above. According to the NOABL database the average wind speeds for the site is: 6.7 m/s at 10m,7.31 m/s at 25m and 7.7 m/s at 45m height for the property postcode (DH8 6LY). Therefore, the wind speeds are not sufficient for a roof mounted wind turbine to be viable |
| Solar PV (Photovoltaic) Panels/Tiles | Yes | The proposed development has sufficient flat roof area for solar panels accommodation. |
| | | Most of the roofs should be free from overshadowing for most of the day from other buildings, structures or trees. |
| | | The site is located in the region with high level of global horizontal irradiation (1,000-1050 kWh/m2/year) |
| Solar Thermal Collectors | Yes | The proposed development has sufficient flat roof area that can accommodate solar thermal panels. |
| | | Most of the roofs should be free from overshadowing for most of the day from other buildings, structures or trees. |
| | | The site is located in the region with high level of global horizontal irradiation (1,000-1050 kWh/m2/year) |
| | | Solar thermal collectors would be compatible with the planned heating system. |
| | | There will be a year round hot water demand. |
| | | In practical domestic solar hot water systems, the solar hot water system is usually run in conjunction with, rather than instead of, a backup conventional boiler and as a result the carbon intensity of the combined system is high relative to other renewables. As a result domestic solar water heating systems are a relatively expensive way of mitigating carbon emissions when compared to traditional solar photovoltaic panels, however they can be successful in reducing load on heating systems. |
| ASHP (Air Source Heat Pump) | Yes | The proposed development has been designed to accommodate the space for a hot water cylinder. |
| | | There are reported performance issues with this technology. During the heating season the outside air temperature is often less than the ground temperature. This lower temperature has the effect of reducing the COP. For an air-to-water heat pump |

| | | |
|---|---|---|
| | | the standard specifies test conditions of 7oC outdoor air temperature (source temperature). At external air temperatures lower than this, the COP will fall, as will the heating output of the heat pump. Depending on the application this reduction may be significant, such as during a cold winter morning when building pre-heat is needed. |
| GSHP (Ground Source Heat Pump) | No | It may be possible to drill a limited number of vertical or horizontal boreholes for GSHP on the site. |
| | | It is possible for developments to accommodate a low-grade heat distribution system (e.g. underfloor water system, oversized radiators). |
| | | The site and neighbourhood contain mature trees. Drilling boreholes on the site create the risk of damaging their roots. |
| | | There is not sufficient space inside all the proposed dwellings for the heat pump equipment. |
| Biomass Boiler | No | There is an established fuel supply chain for the area. |
| | | There is not sufficient space for a delivery vehicle (vehicular access to fuel storage, turning circle etc) |
| | | There is not sufficient space in the proposed buildings for a wood-fuel boiler and associated auxiliary equipment. |
| | | There is not sufficient space for fuel storage to allow a reasonable number of deliveries. |
| | | Biomass systems are management intensive (fuel sourcing, transport, storage) and require adequate expertise from users. |
| CHP | No | Given the proposed building use there won't be a high demand for heat for most of the year, therefore CHP won't be suitable. |
| | | A CHP unit only generates economic and environmental savings when it is running at least 4,500 hours per year. This equates to an average heat demand of about 17 hours a day for five days a week throughout the year. The proposed development energy and heat demand profile does not match this requirement. |
| | | CHP is typically utilized on buildings with high electricity and heating demand for most of the year such as local authority buildings, leisure centres, universities, hotels, and district heating schemes where CHP is used to provide electricity, space and water heating. |

| | | |
|---|---|---|
| | | CHP should be considered wherever there is demand for electricity and an appropriate demand for heat in the near vicinity. |

**Table 4: Feasibility Study of Renewable Technologies**

Based on the feasibility study in table 4 above, the following technologies have been identified as being feasible for the proposed development.

- ASHP
- Solar PV (Photovoltaics)

# 6.0 System Size Options to Provide a $CO_2$ Reduction

As part of this development and the goal to achieve a 40% reduction in CO2 emissions, the developer plans include the provision to install a photovoltaic array, or a community air source heat pump to provide heating for both space and water.

With the installation of 4.5 kWp of solar photovoltaic panels the 40% reduction will be achieved as per Table 5 below-

| | Associated Total $CO_2$ ($kgCO_2/yr$) |
|---|---|
| Baseline (2) | 8,939 |
| Actual CO2 (1) | 5,264 |
| % Reduction | **41.11%** |

**Table 5: Percentage Reduction in Carbon Emissions after installation of 4.5 kWp of Solar PV**

With the installation of a Mitsubishi Ecodan ASHP the 40% reduction will not be achieved as per Table 6 below-

| | Associated Total $CO_2$ ($kgCO_2/yr$) |
|---|---|
| Baseline (2) | 8,939 |
| Actual CO2 (1) | 7270 |
| % Reduction | **18.67%** |

**Table 6: Percentage Reduction in Carbon Emissions after installation of a Mitsubishi Ecodan ASHP**

The results shown in this section show that the minimum 40% reduction in projected CO2 emissions has been met and exceeded by the following measures being adopted by the developer;

- Installation of 4.5 kWp of PV

The potential installation of a community air source heat pump would not lead to the 40% reduction required in planning policy RE1, and would therefore have to be paired with a solar PV system of 2.5 kWp to achieve the required reduction.

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